MINING PLAN
for
ANCILLARY DEVELOPMENT

Presented by

C-b SHALE OIL VENTURE

ASHLAND COLORADO, INC.

OCCIDENTAL OIL SHALE, INC.

OPERATOR

Job No. 5681-01

The Ralph M. Parsons Company
Parsons-Jurden Division

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June 1977

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ASHLAND COLORADO, INC.

OCCIDENTAL OIL SHALE, INC.
OPERATOR

THIS COLLECTION OF OUTLINES AND DIAGRAMS WAS PREPARED FOR YOUR CONVENIENT REFERENCE. IT INCLUDES ITEMS COVERED BY OCCIDENTAL OIL SHALE, INC., DURING THEIR PRESENTATION OF THE MINING PLAN FOR ANCILLARY DEVELOPMENT.

RMP

AMPHIBIAN DEVELOPMENT

DURING WHICH DIFFERENTIATION OF THE ANIMAL PLAN FOR
INCLUDES ITEMS COVERED BY OCCIDENTAL OIL SHALE, INC."
PREPARED FOR YOUR CONVENIENCE REFERENCE." IT
THE COLLECTION TO SOLUTIONS AND DIAGRAMS SAY

OUTLINE OF PRESENTATION

INTRODUCTION

SURFACE FACILITIES

SHAFTS

MINING

RETORTING

VENTILATION

SPECIAL STUDIES

HEALTH & SAFETY

RECLAMATION & REVEGETATION

FISH & WILDLIFE HABITAT MANAGEMENT

CONCLUSION

QUESTIONS & ANSWERS

OUTLINE OF PRESENTATION

- Introduction
- Engineering Activities
- Navigation
- Guidance
- Mission Operations
- Special Studies
- Material Management
- Flight Equipment Refurbishment & Modification
- Conclusions
- Operations Problems

INTRODUCTION

OBJECTIVES

- TRANSLATE OXY'S MODIFIED IN SITU TECHNOLOGY TO HIGH GRADE OIL SHALE WITH THICK SECTION INTO COMMERCIAL OPERATION
- ESTABLISH ENVIRONMENTAL MONITORING PROCEDURES
- OBTAIN OPERATING EXPERIENCE FOR PROCESSING A CLUSTER OF RETORTS
- PROVIDE SITE FOR TRAINING OF MINING AND PROCESSING PERSONNEL
- ATTAIN EARLIEST PRODUCTION TO MEET DUE DILIGENCE REQUIREMENT

DESCRIPTION OF FACILITIES FOR ANCILLARY DEVELOPMENT

SURFACE FACILITIES

- HEADFRAME ON 15' DIA. VENTILATION/ESCAPE SHAFT–147' HIGH
- UTILITY STEAM GENERATION
- CHANGE HOUSE & MINE OFFICE BUILDING
- MAINTENANCE SHOP
- WAREHOUSE
- PROCESS GAS TREATING

SHAFTS

- 15' DIA. VENTILATION/ESCAPE SHAFT - 1700' DEEP (APPROX.)
- 10' DIA. TEMPORARY GAS SHAFT - 1700' DEEP (APPROX.)

MINING

- AIR LEVEL DRIFT - 30' WIDE X 20' HIGH
- PRODUCTION LEVEL DRIFT - 30' WIDE X 20' HIGH

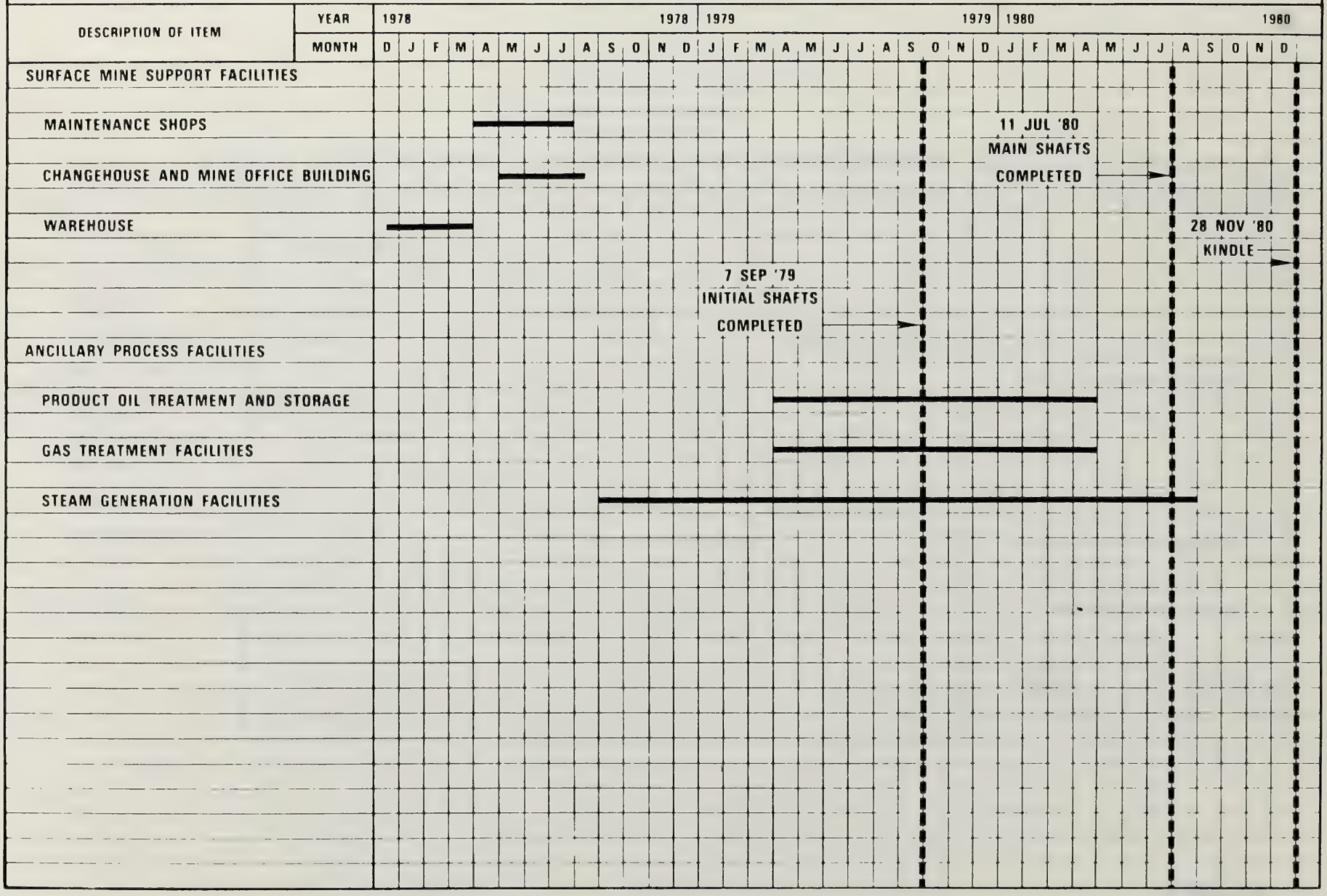
RETORTS

- 2 RETORTS - 150' X 405' X 290' HIGH - OPERATED TOGETHER
- 4 RETORTS - " " " " - OPERATED AS A CLUSTER

OCCIDENTAL OIL SHALE INC., C-b TRACT

ANCILLARY FACILITIES

SURFACE PROCESS AND MINE SUPPORT FACILITIES



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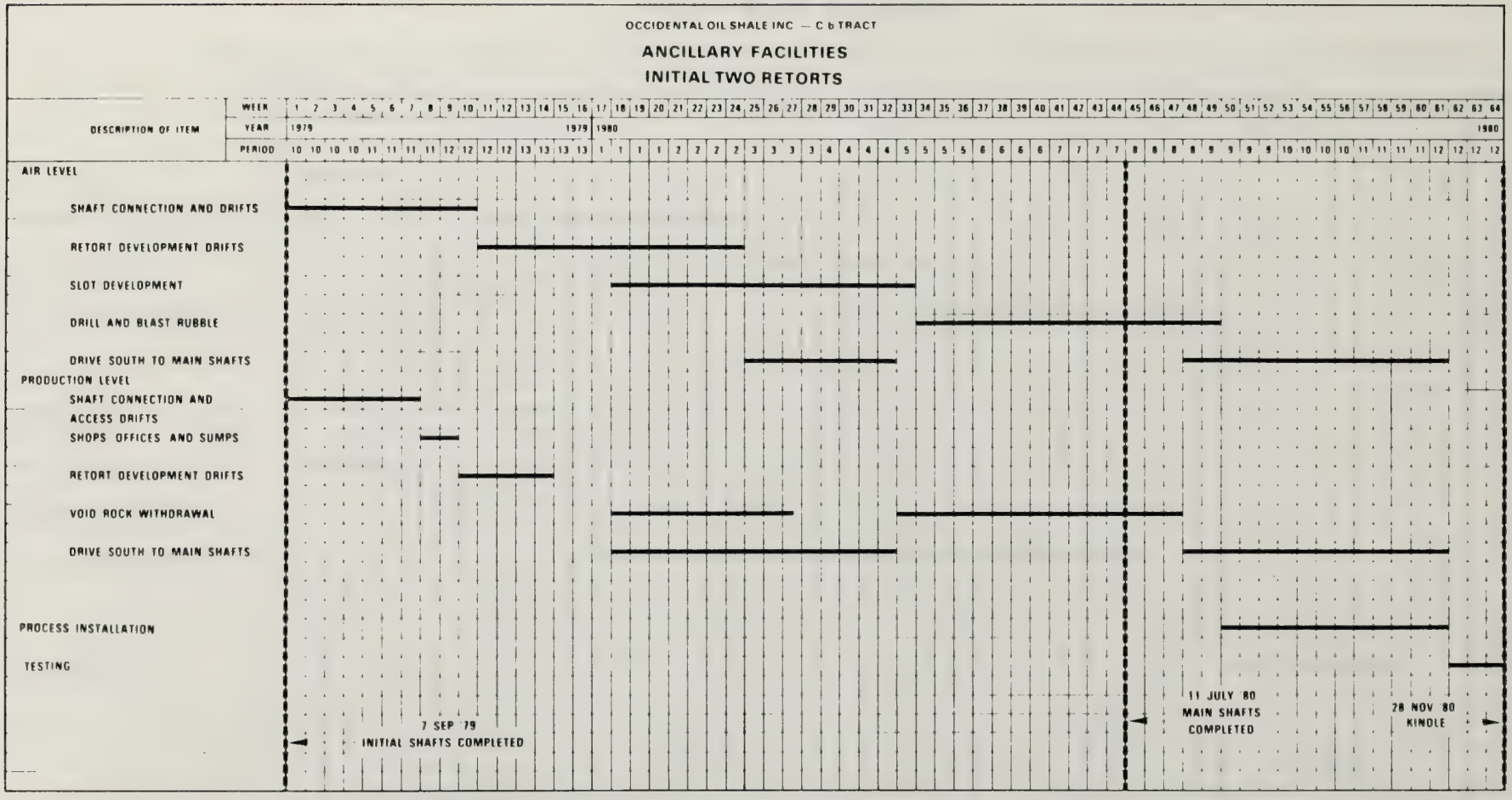
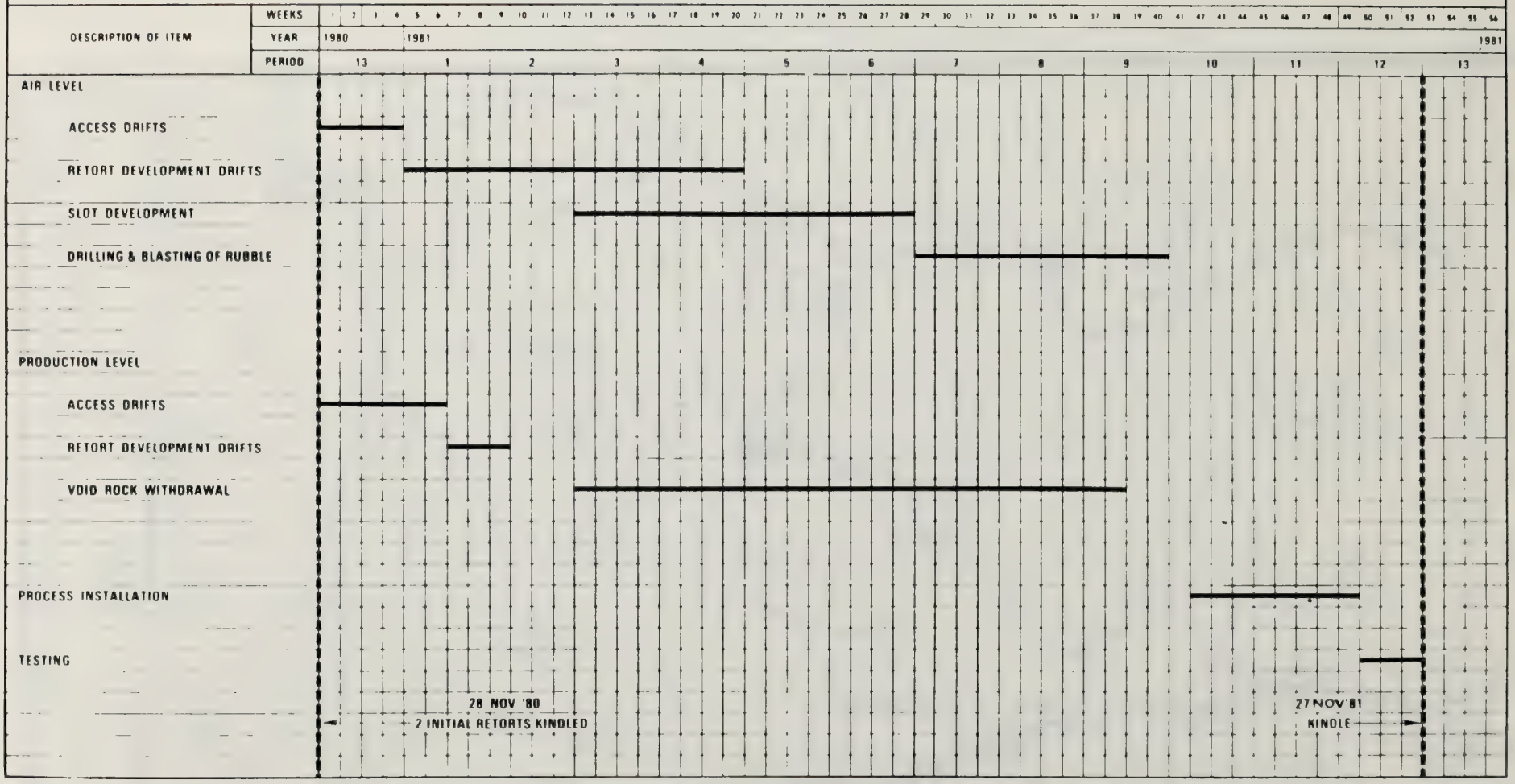
OCCIDENTAL OIL SHALE INC — C b TRACT

ANCILLARY FACILITIES
INITIAL TWO RETORTS



OCCIDENTAL OIL SHALE INC., C-b TRACT

ANCILLARY FACILITIES
FOUR TEST RETORTS



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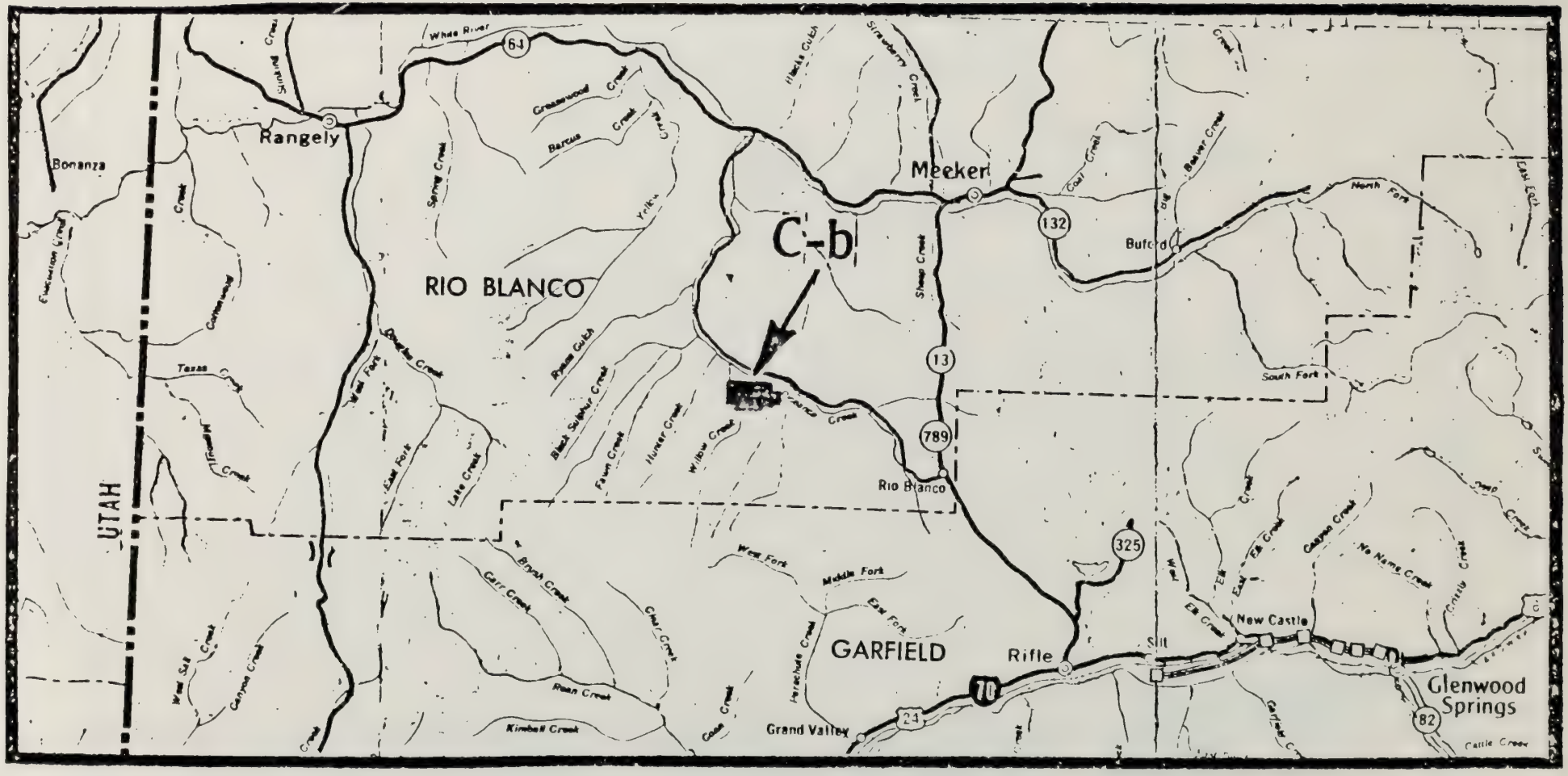
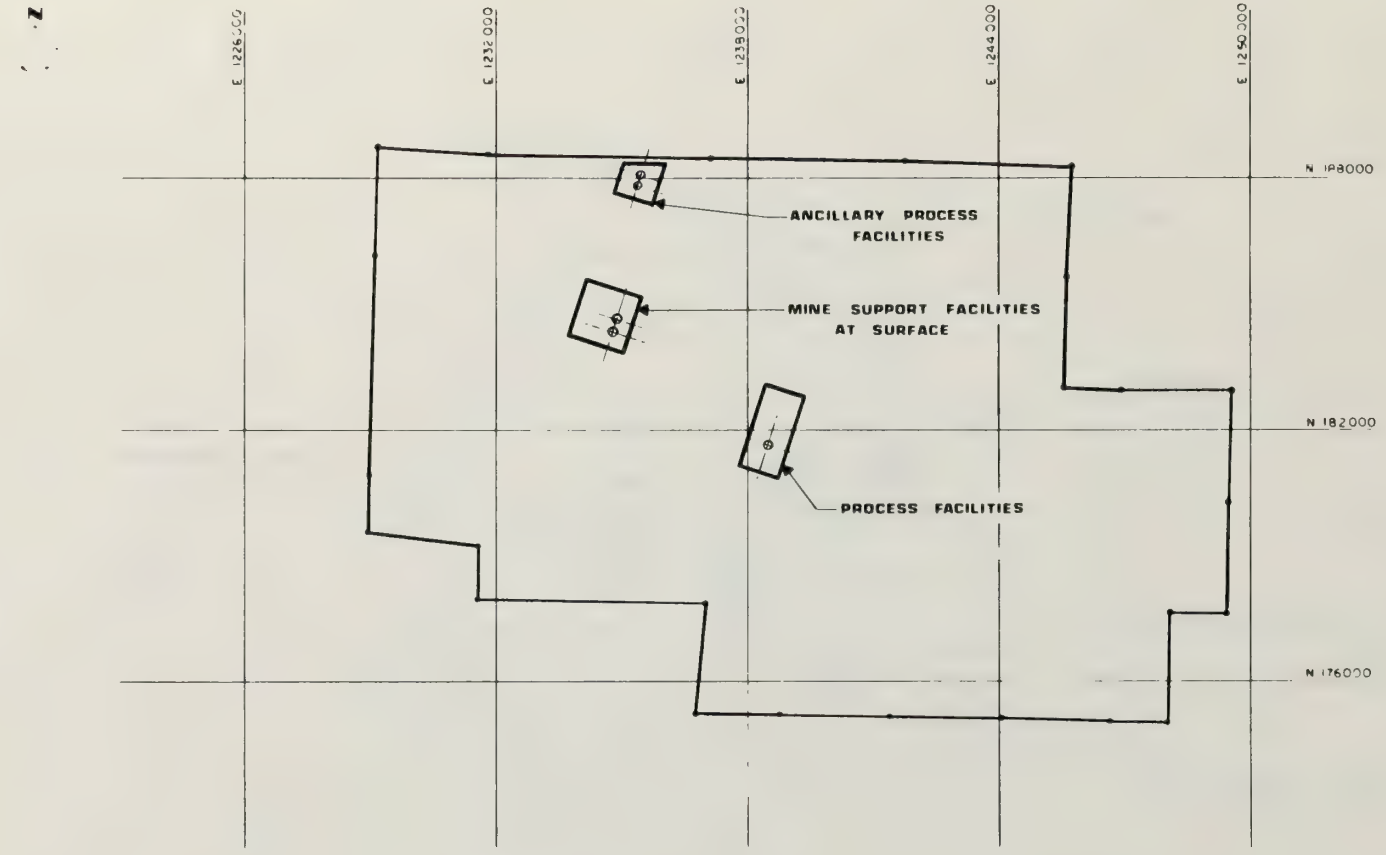
LOCATION OF TRACT C-b

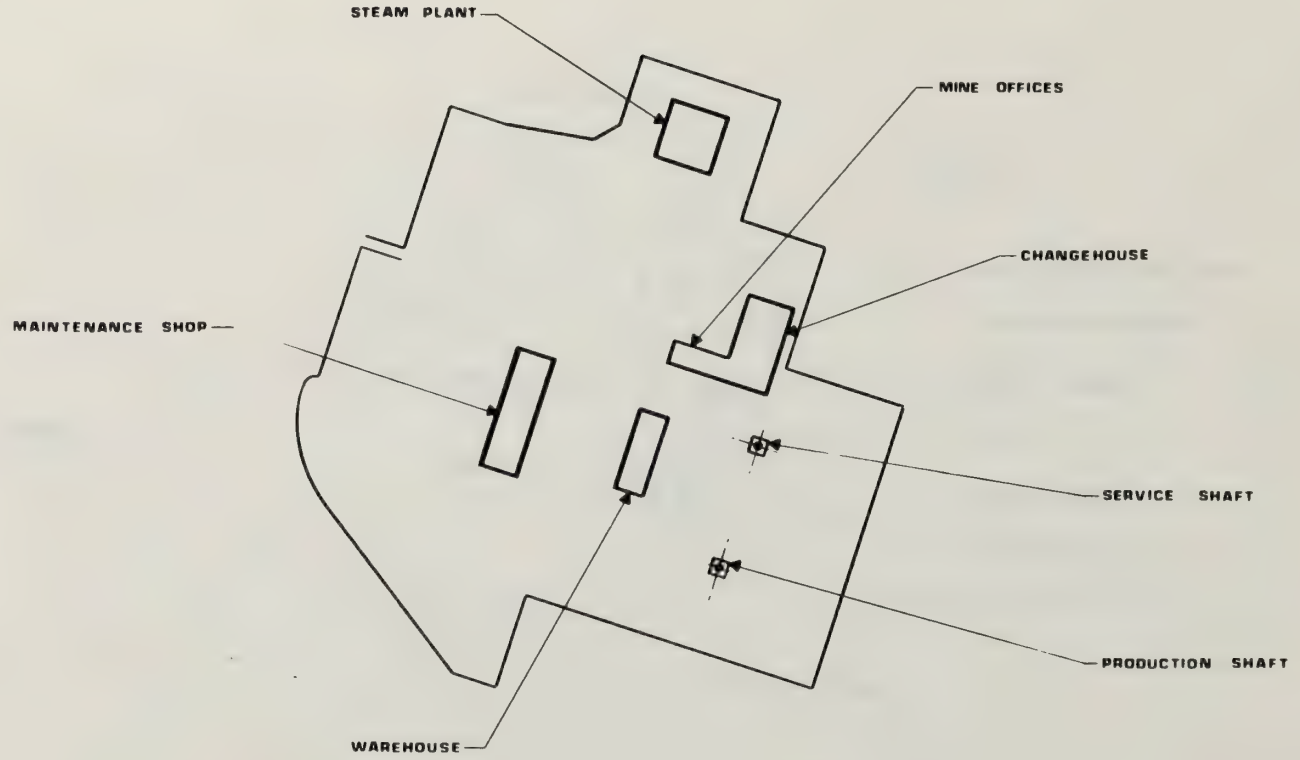




OCCIDENTAL OIL SHALE INCORPORATED
C b SHALE OIL VENTURE

PARSONS-JURDEN
DIVISION OF
THE RALPH M. PARSONS COMPANY
PASADENA, CALIFORNIA

C-b TRACT
GENERAL ARRANGEMENT



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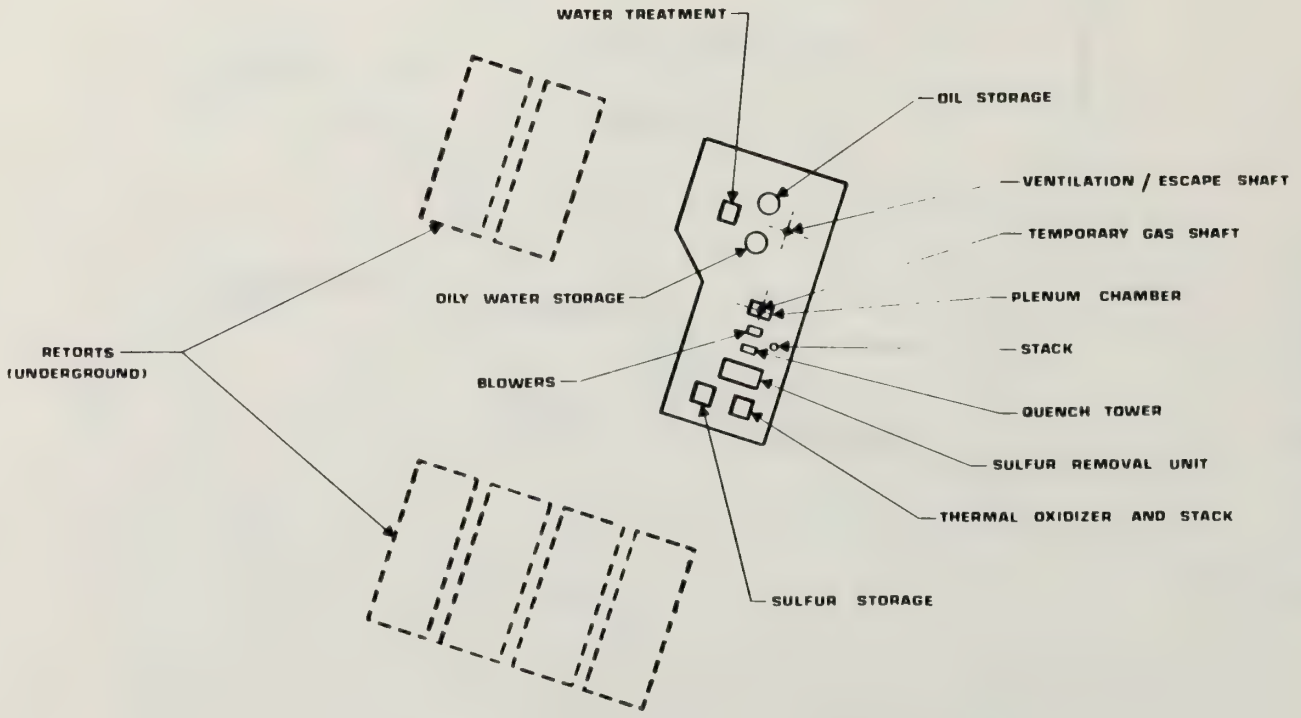
PARSONS-JURDEN
DIVISION OF
THE RALPH M. PARSONS COMPANY
PASADENA CALIFORNIA

MINE SUPPORT FACILITIES AT SURFACE

JOB NUMBER 56810

DRAWING NUMBER

ACCOUNT NUMBER



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C-b SHALE OIL VENTURE

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DIVISION OF
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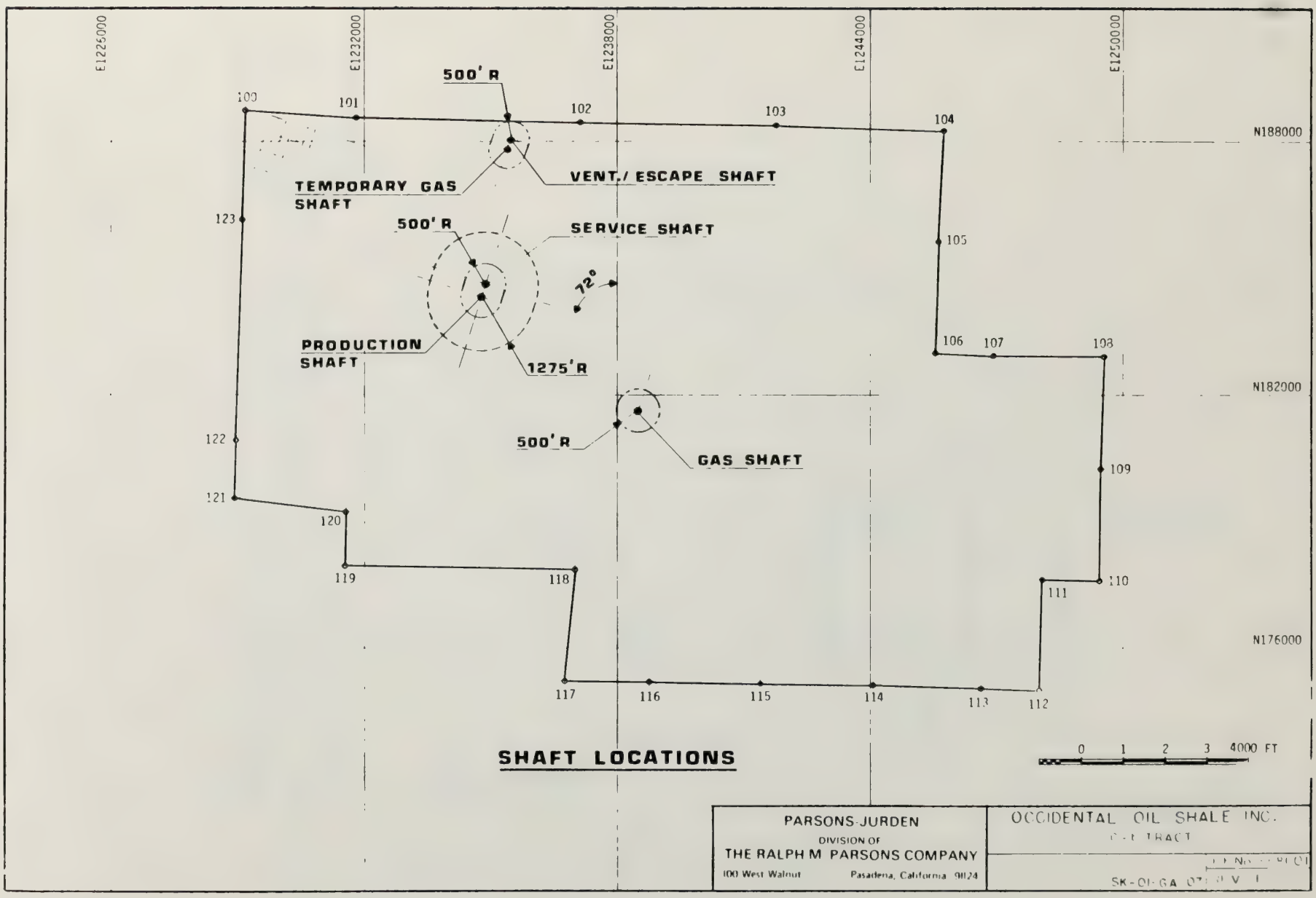
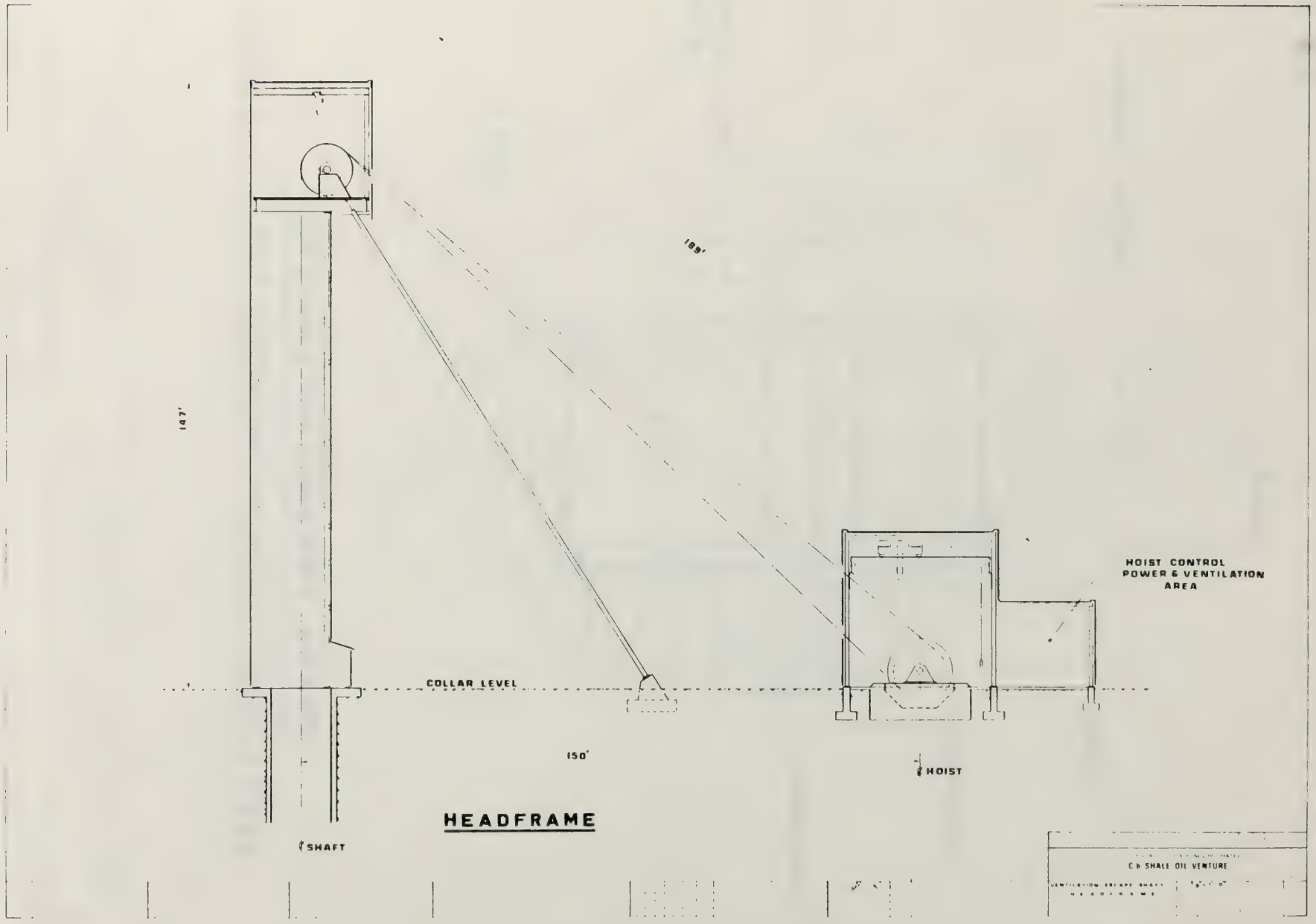
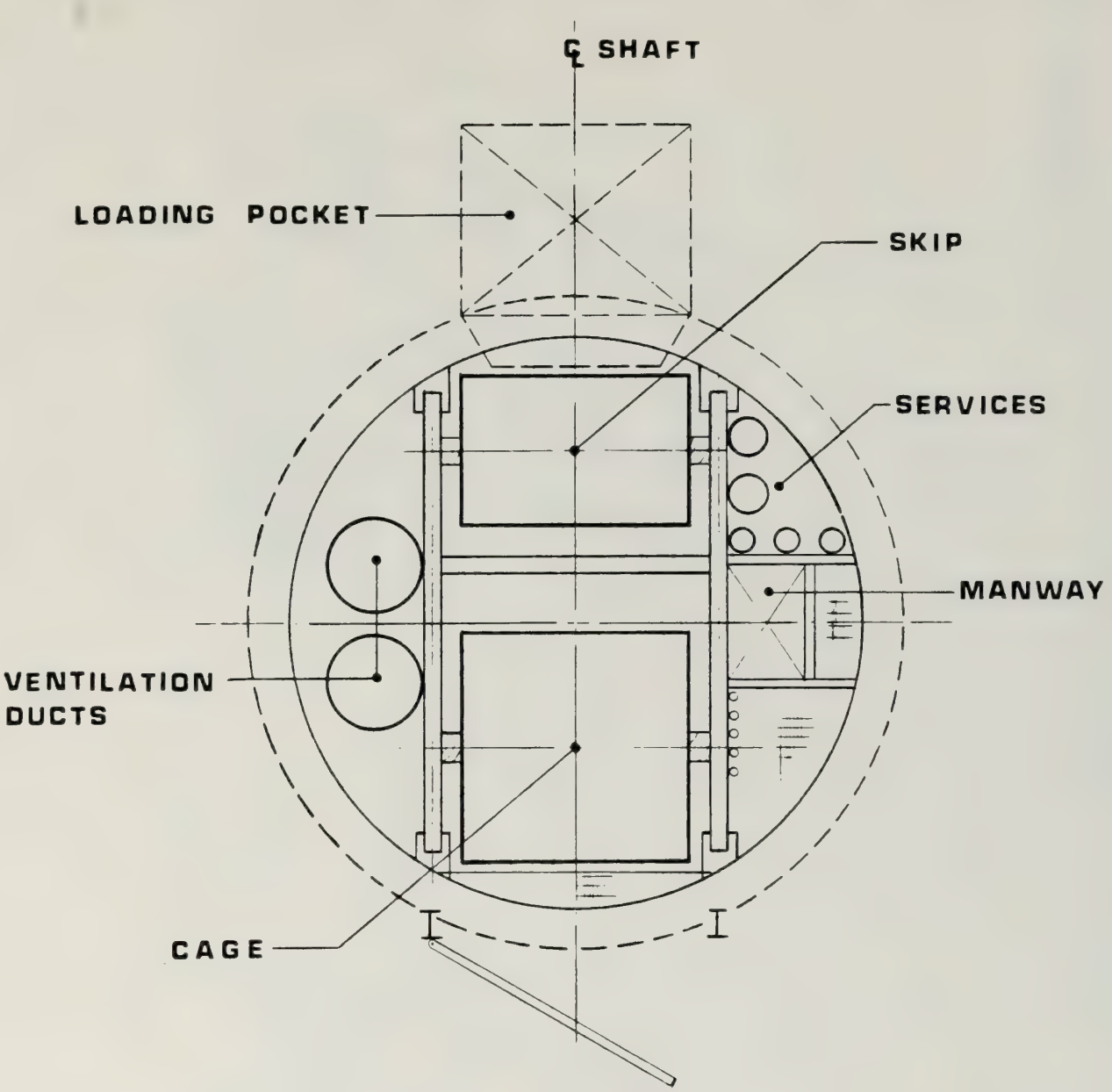
PASADENA CALIFORNIA

ANCILLARY PROCESS FACILITIES


E1226000
E1232000
E1238000
E1244000
E1250000
N188000
N182000
N176000
500' R
TEMPORARY GAS SHAFT
VENT./ ESCAPE SHAFT
SERVICE SHAFT
500' R
72°
PRODUCTION SHAFT
1275'R
500' R
GAS SHAFT
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
SHAFT LOCATIONS
0 1 2 3 4000 FT
PARSONS-JURDEN
DIVISION OF
THE RALPH M PARSONS COMPANY
100 West Walnut Pasadena, California 91124
OCCIDENTAL OIL SHALE INC.
TRACT

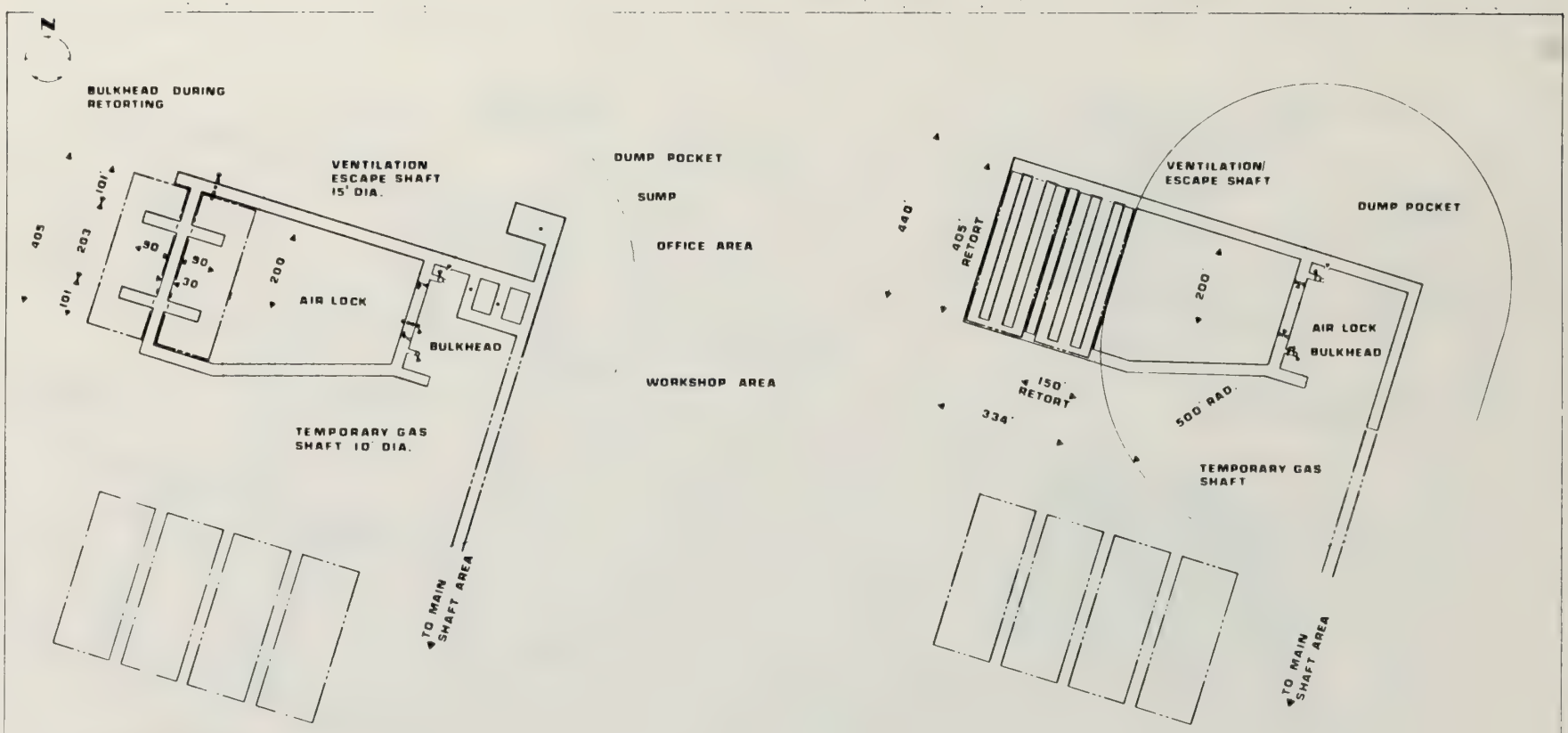

147'
189'
COLLAR LEVEL
150'
HOIST CONTROL
POWER & VENTILATION
AREA
HOIST
SHAFT
HEADFRAME
C-b SHALE OIL VENTURE

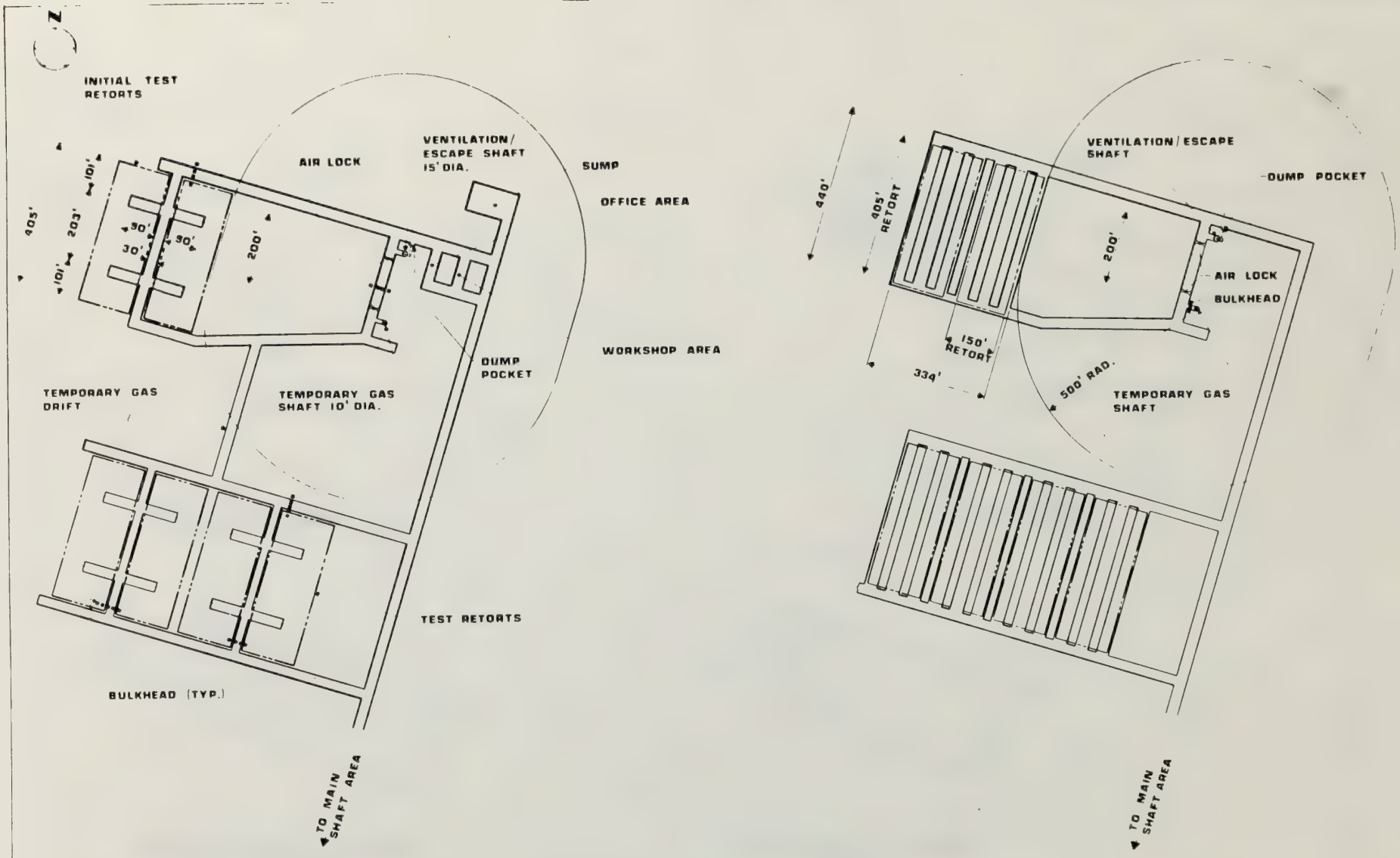


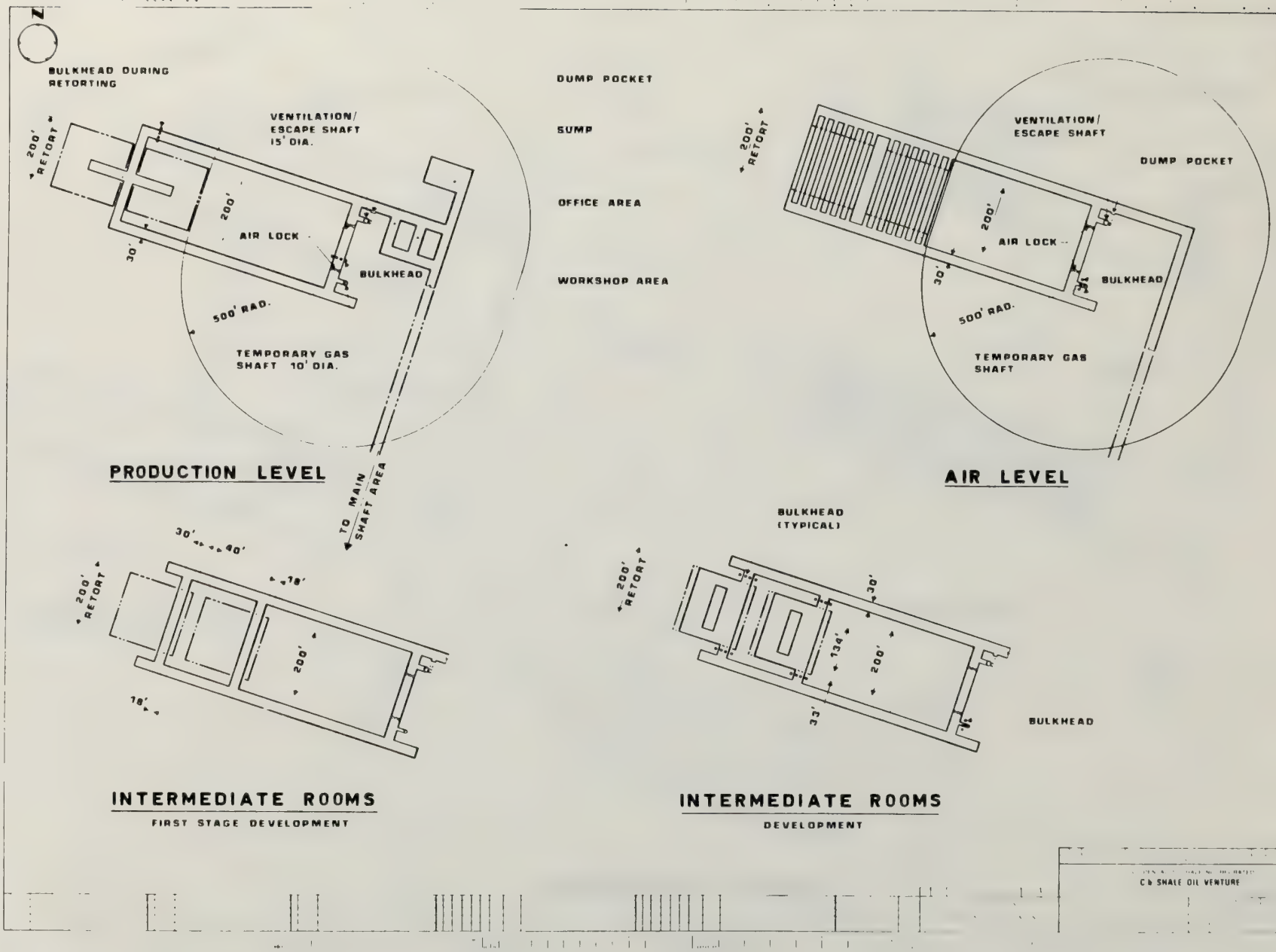
VENTILATION/ESCAPE SHAFT

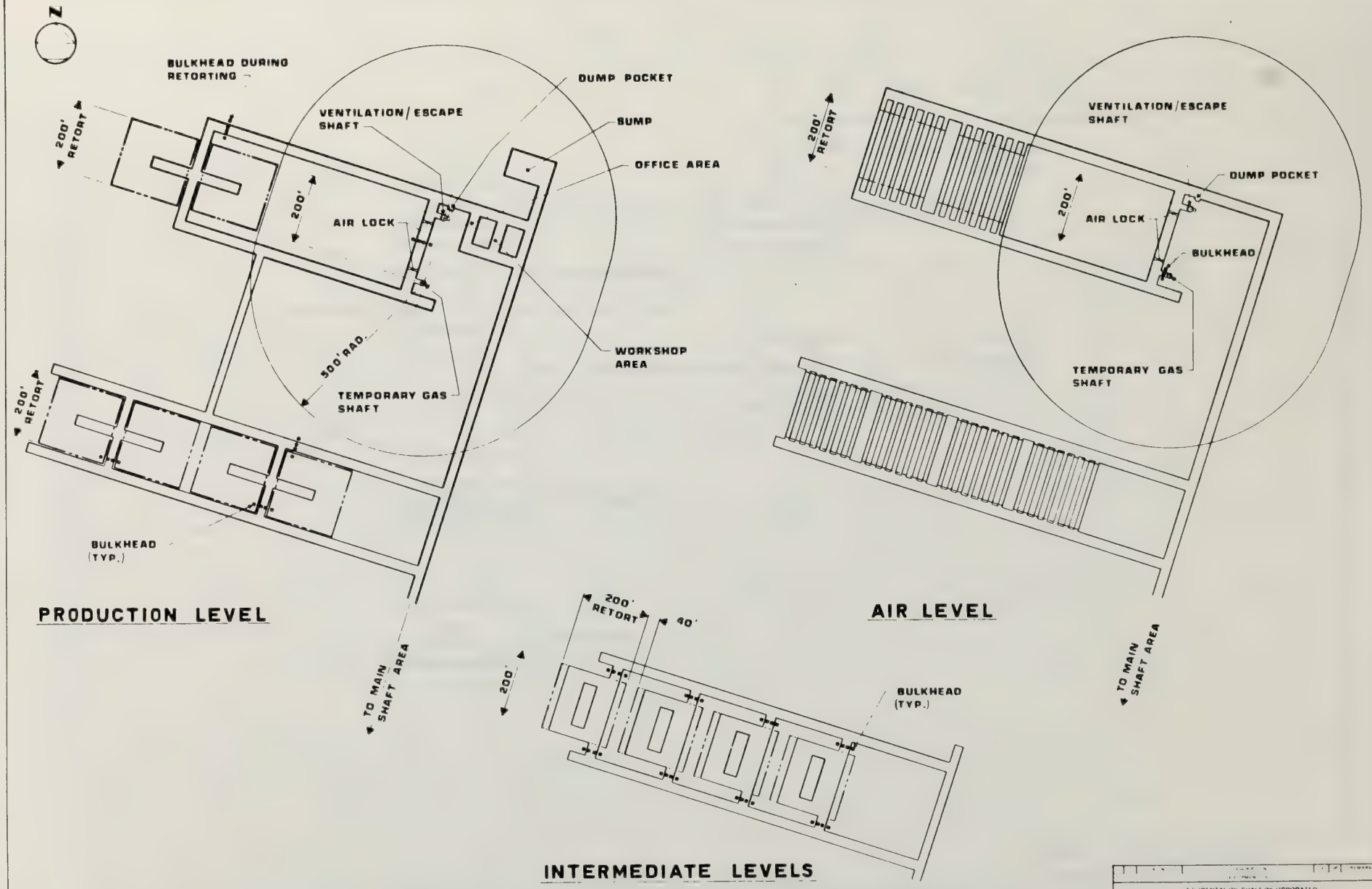
GENERAL ARRANGEMENT-PRODUCTION LEVEL

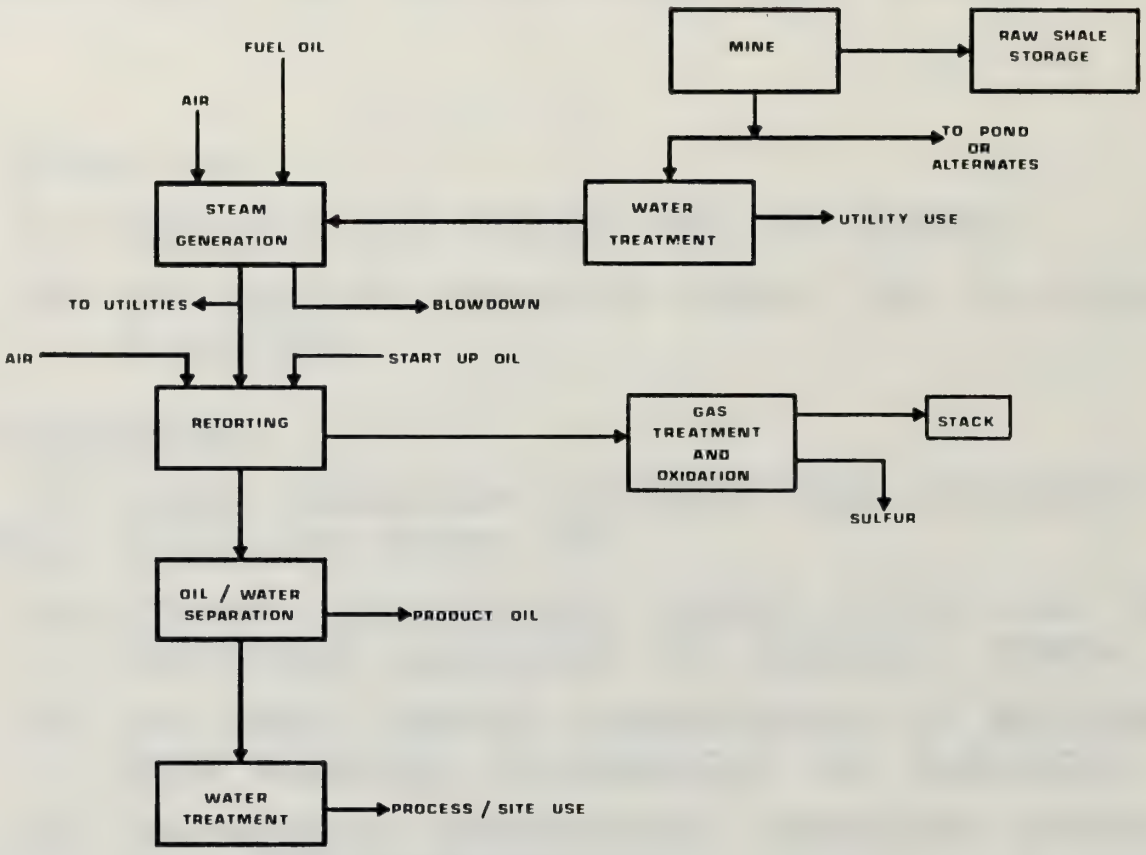
PARSONS-JURDEN DIVISION OF THE RALPH M PARSONS COMPANY 100 West Walnut Pasadena, California 91124	OCCIDENTAL OIL SHALE INC. C-b TRACT
	Job No 5681-01
SK-01-GA-08	REV.


N
BULKHEAD DURING RETORTING
VENTILATION ESCAPE SHAFT 15' DIA.
DUMP POCKET
SUMP
OFFICE AREA
WORKSHOP AREA
405'
203'
101'
101'
30'
30'
30'
200'
AIR LOCK
BULKHEAD
TEMPORARY GAS SHAFT 10' DIA.
TO MAIN SHAFT AREA
PRODUCTION LEVEL
440'
405' RETORT
VENTILATION/ ESCAPE SHAFT
DUMP POCKET
200'
AIR LOCK
BULKHEAD
150' RETORT
334'
500' RAD.
TEMPORARY GAS SHAFT
TO MAIN SHAFT AREA
AIR LEVEL
C-b SHALE OIL VENTURE


N
INITIAL TEST RETORTS
AIR LOCK
VENTILATION/ ESCAPE SHAFT 15' DIA.
SUMP
OFFICE AREA
WORKSHOP AREA
DUMP POCKET
405'
101'
203'
101'
30'
30'
30'
200'
TEMPORARY GAS DRIFT
TEMPORARY GAS SHAFT 10' DIA.
TEST RETORTS
BULKHEAD (TYP.)
TO MAIN SHAFT AREA
PRODUCTION LEVEL
440'
405' RETORT
VENTILATION/ ESCAPE SHAFT
DUMP POCKET
200'
AIR LOCK
BULKHEAD
150' RETORT
334'
500' RAD.
TEMPORARY GAS SHAFT
TO MAIN SHAFT AREA
AIR LEVEL


N
BULKHEAD DURING RETORTING
VENTILATION/ ESCAPE SHAFT 15' DIA.
200' RETORT
200'
AIR LOCK
30'
BULKHEAD
500' RAD.
TEMPORARY GAS SHAFT 10' DIA.
DUMP POCKET
SUMP
OFFICE AREA
WORKSHOP AREA
PRODUCTION LEVEL
TO MAIN SHAFT AREA
VENTILATION/ ESCAPE SHAFT
DUMP POCKET
200' RETORT
200'
AIR LOCK
30'
BULKHEAD
500' RAD.
TEMPORARY GAS SHAFT
AIR LEVEL
30'
40'
200' RETORT
78'
200'
78'
INTERMEDIATE ROOMS
FIRST STAGE DEVELOPMENT
BULKHEAD (TYPICAL)
200' RETORT
30'
134'
200'
33'
BULKHEAD
INTERMEDIATE ROOMS
DEVELOPMENT
C-b SHALE OIL VENTURE


N
BULKHEAD DURING RETORTING
200' RETORT
VENTILATION/ESCAPE SHAFT
DUMP POCKET
SUMP
OFFICE AREA
200'
AIR LOCK
500' RAD.
WORKSHOP AREA
TEMPORARY GAS SHAFT
200' RETORT
BULKHEAD (TYP.)
PRODUCTION LEVEL
TO MAIN SHAFT AREA
200' RETORT
VENTILATION/ESCAPE SHAFT
DUMP POCKET
200'
AIR LOCK
BULKHEAD
TEMPORARY GAS SHAFT
AIR LEVEL
TO MAIN SHAFT AREA
200' RETORT
40'
200'
BULKHEAD (TYP.)
INTERMEDIATE LEVELS
C-b SHALE OIL VENTURE



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C-b SHALE OIL VENTURE

PARSONS-JURDEN
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PASADENA CALIFORNIA

MODIFIED IN SITU RETORTING
BLOCK FLOW DIAGRAM

5681-01

DESCRIPTION OF RETORTING IN BRIEF

(A) START-UP

(1) BURNERS LET DOWN TOP OF RUBBLE.

(2) AIR PULLED THROUGH FROM TOP BY EXHAUST BLOWERS.

(B) RETORTING

(1) WHEN REACTION TEMPERATURE REACHED BURNERS ~~[illegible]~~ TURN OFF.

(2) STEAM INTRODUCED ALONG WITH AIR TO MAINTAIN BURNING AT DESIRED TEMP.

(3) OIL AND WATER CONDENSES AT BOTTOM AND PUMPED SEPARATELY TO SURFACE.

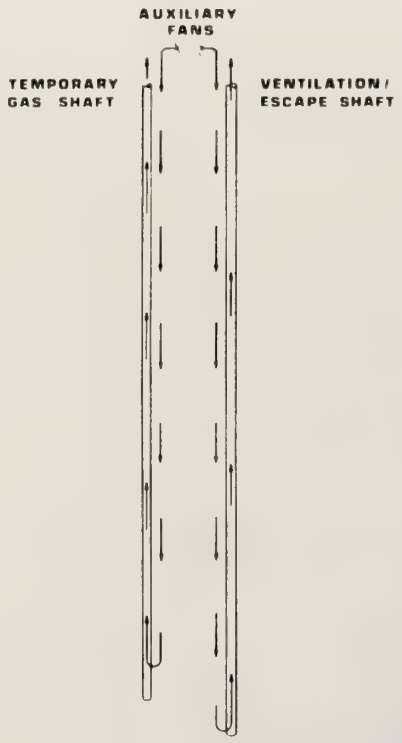
(4) OFF-GASES EXHAUSTED THROUGH BLOWERS TO GAS TREATMENT.

(C) RETORT SHUTDOWN

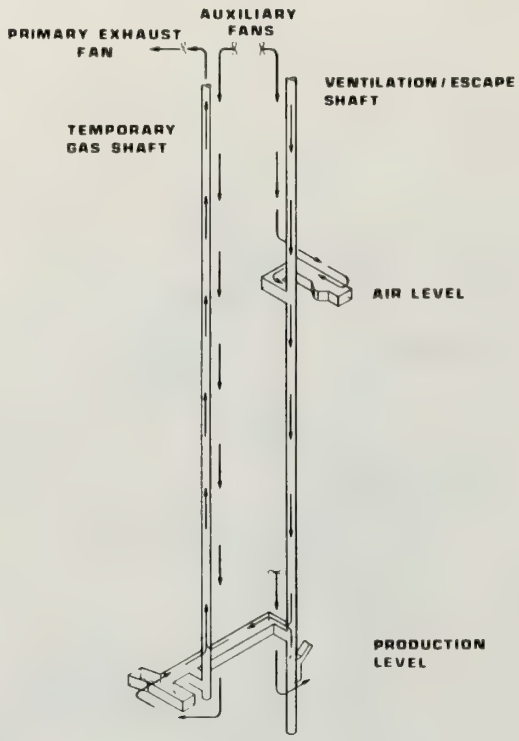
(1) INLET HOLES AT TOP SHUT OFF, SHUTTING OFF AIR.

(2) RETORT ALLOWED TO COOL DOWN WITH BOTTOM VENT TO GAS SHAFT OPEN.

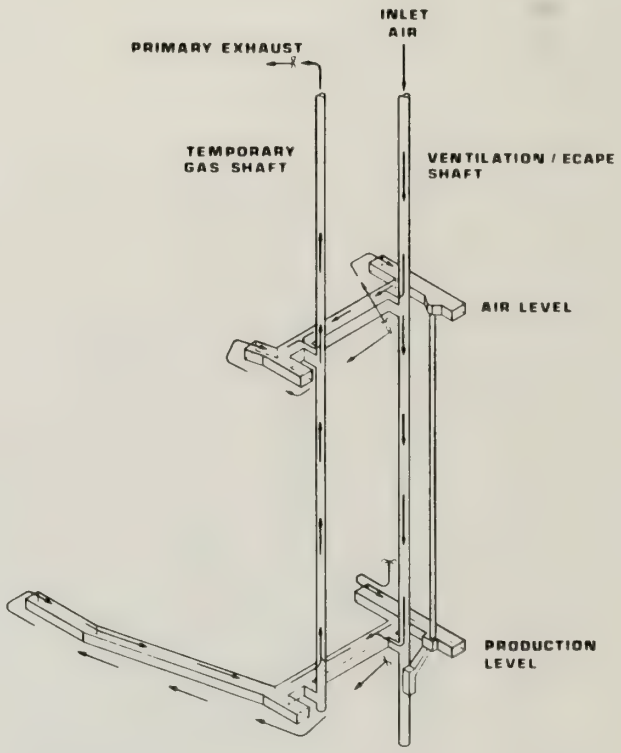
(3) OFF-GASES PRODUCED AFTER SHUTDOWN FLARED.



PHASE - 1



PHASE - 2

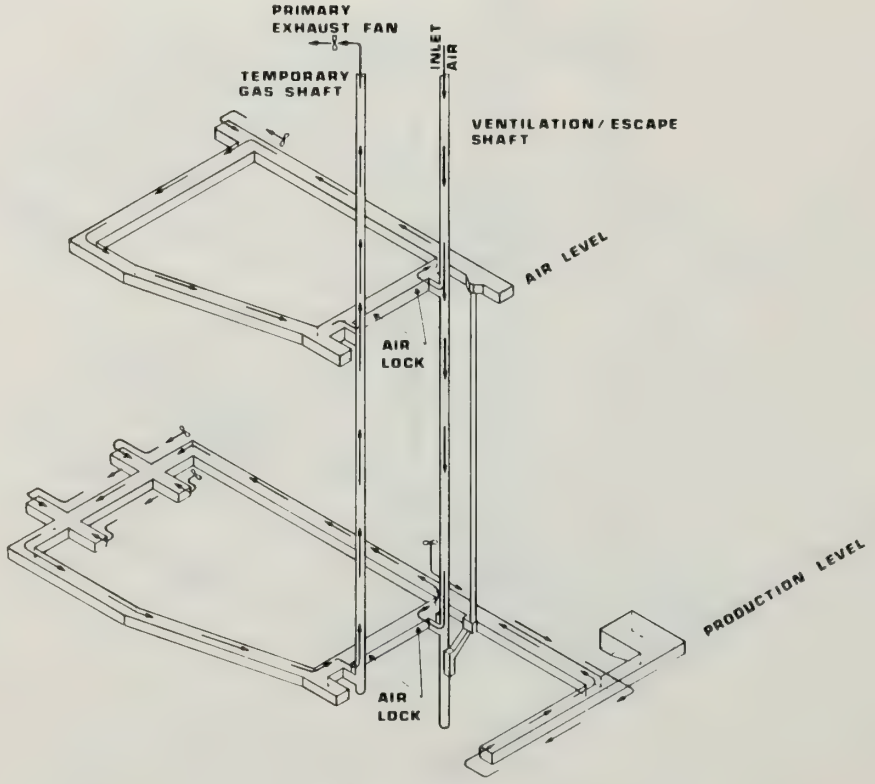


PHASE - 3

VENTILATION CIRCUITS DURING DEVELOPMENT

⟵ : AUXILIARY VENTILATION SYSTEM

C & S SHALE OIL VENTURE

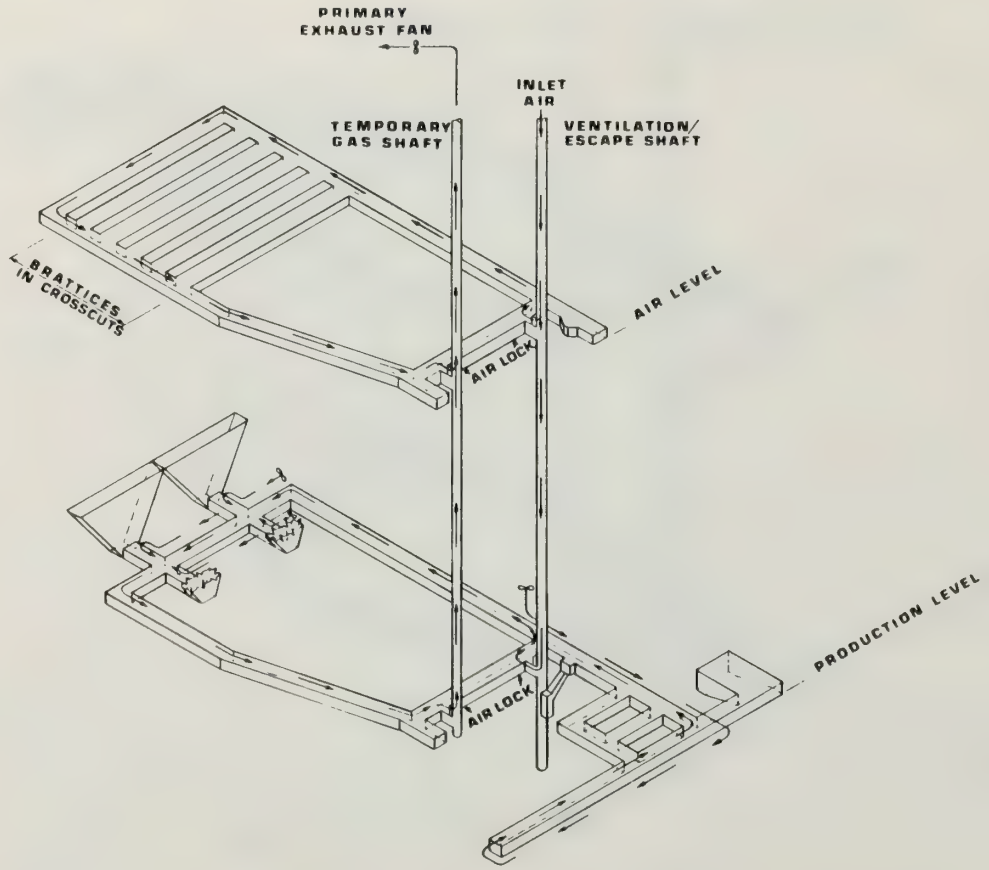


: AUXILIARY VENTILATION SYSTEM

PHASE - 4

VENTILATION CIRCUITS DURING DEVELOPMENT

C & SHALE OIL VENTURE

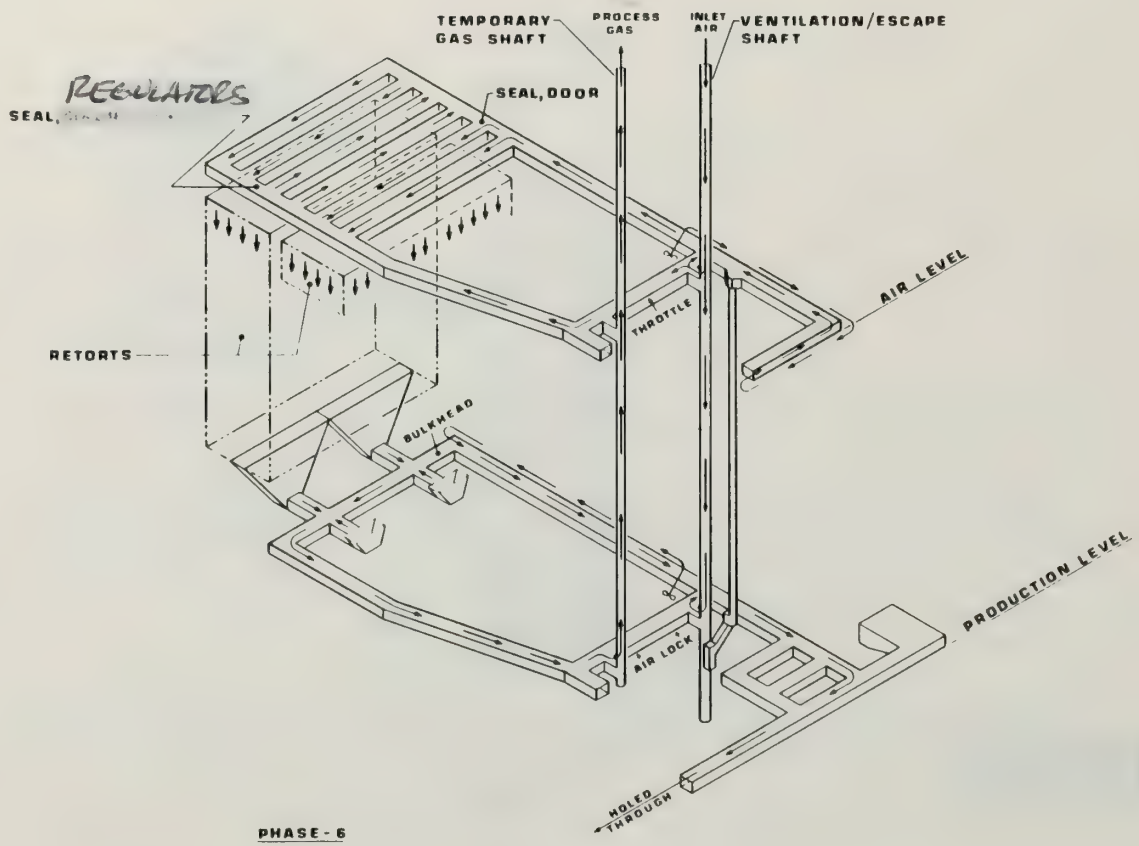


PHASE - 5

→ - AUXILIARY VENTILATION SYSTEM

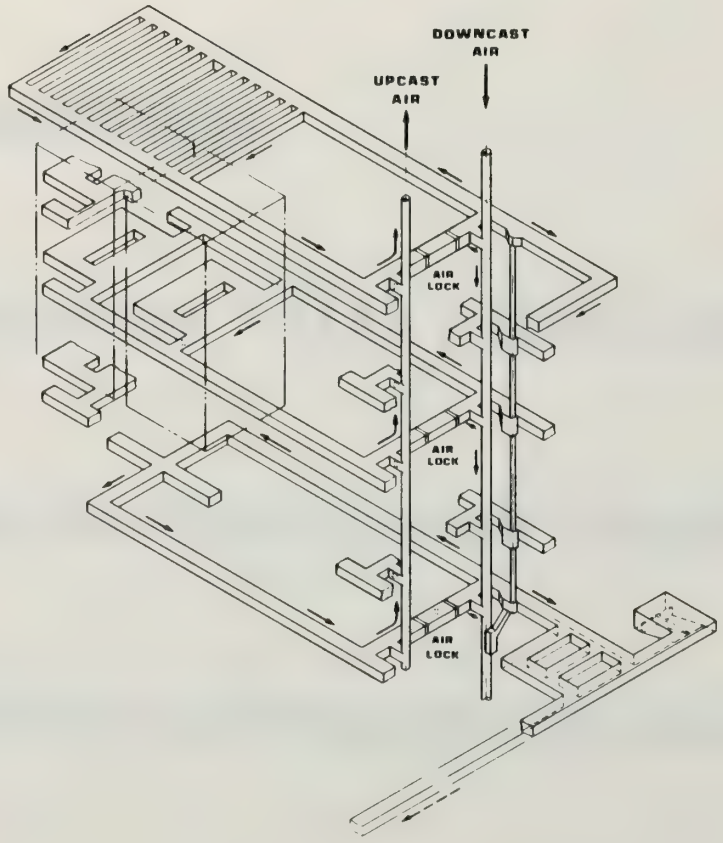
VENTILATION CIRCUITS DURING DEVELOPMENT

C-b SHALE OIL VENTURE



VENTILATION CIRCUITS DURING RETORTING

C-b SHALE OIL VENTURE



* BULKHEADS AS REQUIRED

H.F.F. RETORTS
VENTILATION AIR FLOW
(PRIOR TO RETORTING)

OCCIDENTAL OIL SHALE INCORPORATED
C-b SHALE OIL VENTURE

SPECIAL STUDIES PROGRAM — OUTLINE

1. STABILITY OF MINE OPENINGS

2. SUBSIDENCE

3. BOUNDARY PILLAR PROTECTION

4. RETORT STABILIZATION (ABANDONMENT)

5. RETORT LEACHING/WATER MANAGEMENT

6. AIR QUALITY MODELING

RMP

1. STABILITY OF MINE OPENINGS

A. SHAFT PILLAR DESIGN

(1) FUNCTIONS OF SHAFT PILLARS

(2) HISTORICAL DESIGN METHODS

(3) PILLAR AND STRENGTHS

(4) SUBSIDENCE LIMITATIONS

B. MINE OPENINGS

(1) FUNCTION OF THE OPENINGS

(2) DESIGN METHODS

(3) GEOLOGIC HORIZONS

(4) MONITORING

RMP

2. SUBSIDENCE

A. PREDICTION OF SUBSIDENCE POTENTIAL

(1) LITERATURE REVIEW

(2) DEVELOP EMPIRICAL EQUATION

B. MONITORING

(1) SURFACE MONITORING NETWORK

(2) UNDERGROUND MONITORING NETWORK

C. ANALYSIS

(1) ACCURACY OF PREDICTION

(2) REQUIRED CHANGES

AMP

3. BOUNDARY PILLAR PROTECTION

A. REQUIREMENTS

B. LOADS

C. ROCK STRENGTH

D. DESIGN

E. MONITORING

4. RETORT STABILIZATION (ABANDONMENT)

A. DEVELOP CRITERIA

B. DESIGN STABILIZATION PLAN

C. IMPLEMENT DESIGN

D. MONITORING AND EVALUATION

RMP

5. RETORT LEACHING/WATER MANAGEMENT

A. OBJECTIVE

(1) DETERMINE EFFECT OF SPENT SHALE CONTACT ON WATER QUALITY

(2) PREDICT QUALITY OF RESULTING GROUNDWATER

B. METHOD

(1) ESTABLISH BACKGROUND DATA ON SPENT RETORT

(2) INTRODUCE WATER OF KNOWN QUALITY INTO SPENT RETORT AT A KNOWN RATE

(3) MONITOR EFFLUENT QUANTITY AND QUALITY

(4) EXTEND TEST FOR SUFFICIENT TIME

C. RESULTS

- SHOW WHICH CONSTITUENTS ARE LEACHED AND HOW FAST

RMP

6. AIR QUALITY MODELING

A PURPOSE

TO DETERMINE THE FEASIBILITY OF MEETING AIR QUALITY REGULATIONS DURING THE ANCILLARY PHASE OF THE C-b PROJECT.

B METHOD

(1) CHARACTERIZE ATMOSPHERIC EXHAUSTS AND FUGITIVE DUST SOURCES FROM PROCESS INFORMATION.

(2) QUANTIFY METEOROLOGY OF THE SITE FROM BASELINE DATA AND DETERMINE "WORST CASE" CONDITIONS.

(3) MODEL POLLUTANT DISPERSIONS AND CALCULATE GROUND LEVEL CONCENTRATIONS OF PARTICULATES, SULFUR DIOXIDE, CARBON MONOXIDE, HYDROCARBONS, AND OXIDES OF NITROGEN FOR CRITERION AVERAGING TIMES.

(4) VARY STACK HEIGHT AND SHALE PILE ACREAGE PARAMETRICALLY TO DETERMINE LIMITING CONDITIONS FOR MEETING AIR QUALITY REGULATIONS.

C KEY CONDITIONS AND ASSUMPTIONS

(1) MINE EXHAUST OPERATES AT FULL-SCALE RATES.

(2) RETORTING OPERATES AT 10% OF FULL-SCALE PRODUCTION RATE.

RMP

6. AIR QUALITY MODELING (CONTD)

(3) RETORT OFF-GAS IS SCRUBBED TO REMOVE SULFUR COMPOUNDS DOWN TO EQUIVALENT OF 15 PPMV H_2S AND THEN BURNED.

(4) ALL FUEL OIL USED, E.G., IN ANFO AND THE BOILER, CONTAINS 0.023% S MAXIMUM.

(5) MINE VENT STACK AND BOILER EXHAUST STACK MUST EXHAUST AT AN ELEVATION GREATER THAN THE HOIST HOUSE.

(6) MINE VENT EXHAUST VELOCITY IS 15 METERS/SEC MINIMUM.

(7) OFF-GAS AND BOILER EXHAUST TEMPERATURES ARE 400°F MINIMUM.

(8) THE EPA VALLEY MODEL IS USED TO PREDICT GROUND LEVEL CONCENTRATIONS.

D RESULTS

(1) ALL AIR QUALITY REGULATIONS CAN BE MET PROVIDING FUGITIVE DUST FROM UNVEGETATED SHALE IS KEPT TO 128 TONS/YR, WHICH CORRESPONDS APPROXIMATELY TO 80% DUST CONTROL OF 80 ACRES, ASSUMING THAT UNCONTROLLED DUST WOULD BE 8 TONS/ACRE/YR.

(2) THERE IS LATITUDE FOR MORE SULFUR DIOXIDE EMISSIONS WITHOUT VIOLATING AIR QUALITY REGULATIONS WITH A 25-METER OFF-GAS STACK. TALLER STACKS WOULD AFFORD STILL GREATER LATITUDE.

RMP

HEALTH AND SAFETY PROGRAM - OUTLINE

1. SAFETY PROGRAM AND PERSONNEL
   MEDICAL FACILITIES
2. GROUND CONTROL
   FIRE PREVENTION AND CONTROL
   MINE VENTILATION
3. MAN HOISTING
   EMERGENCY PROCEDURES AND ESCAPEWAYS
   ELECTRICAL
4. EXPLOSIVES
   HAULAGE AND DRILLING EQUIPMENT
   VARIANCES AND PERMITS

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SAFETY PROGRAM AND PERSONNEL

A. PERSONNEL

1. SAFETY MANAGER
2. SAFETY INSPECTORS - ONE PER SHIFT
3. E.M.T. - EIGHT PER SHIFT

B. INSPECTION AND MONITORING - REGULAR SAFETY INSPECTIONS AND MONITORING OF SAFETY PROGRAM

C. PROGRAM

1. DAILY SAFETY CONTACTS
2. WEEKLY CREW MEETINGS
3. MONTHLY DEPARTMENT MEETINGS
4. MONTHLY SUPERVISORS SAFETY MEETINGS

MEDICAL FACILITIES

A. AMBULANCES - SURFACE

1. THREE FULLY EQUIPPED AMBULANCES
2. AIR AMBULANCE SERVICE TO GRAND JUNCTION AND/OR DENVER

B. AMBULANCES — UNDERGROUND

C. FIRST AID ROOMS — UNDERGROUND

D. EMERGENCY ROOM — SURFACE

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GROUND CONTROL

A. SIZE AND LOCATION OF OPENINGS
B. NUMBER OF RETORT DRIFTS AND LEVELS
C. GROUND STABILIZATION

FIRE PREVENTION AND CONTROL

A. MOBILE FIRE FIGHTING EQUIPMENT - SURFACE
B. UNDERGROUND DIESEL AND ELECTRICAL EQUIPMENT
C. CONVEYOR BELTS BOTH SURFACE AND UNDERGROUND
D. UNDERGROUND FIRE WATER SYSTEM
E. FIRE EXTINGUISHER PROGRAM
F. FIRE BRIGADE BOTH SURFACE AND UNDERGROUND

MINE VENTILATION

A. FACE AIR QUANTITIES
B. FACE AIR QUALITY
C. PROCESS GAS CONTROL

AMP

MAN HOISTING

EMERGENCY MINE EVACUATION PROCEDURES

A. ESTABLISH MINE EVACUATION PLAN
B. WARNING SYSTEMS
C. EDUCATION AND TRAINING
D. REFUGE CHAMBERS
E. MINE RESCUE TEAMS

ELECTRICAL

A. INSTALLATION PER NATIONAL ELECTRICAL CODE
B. PERMISSIBLE EQUIPMENT
C. SPECIAL PROCEDURE

AMP

EXPLOSIVES

A. TYPE OF EXPLOSIVE
B. STORAGE FACILITIES
C. TRANSPORTATION

HAULAGE AND DRILLING EQUIPMENT

A. CONTROL OF DIESEL EXHAUST
B. ROLLOVER PROTECTION AND FIRE SUPPRESSION
C. VENTILATION
D. CONVEYOR BELTS
E. FUEL STORAGE AND DISPENSING AREAS

VARIANCES AND PERMITS

RMP

EROSION CONTROL AND REHABILITATION PLAN - OUTLINE

1. INTRODUCTION

2. EROSION CONTROL METHODS AND APPLICATION

3. SURFACE REHABILITATION PLAN

4. SUMMARY

RMP

1. INTRODUCTION

2. EROSION CONTROL METHODS AND APPLICATION

3. SURFACE REHABILITATION PLAN, INCLUDING DEMONSTRATION TECHNOLOGY FOR REVEGETATION

   A. DESCRIPTION OF DISTURBANCES WITH ESTIMATED ACRES INVOLVED

   B. REVEGETATION OF DISTURBED AREAS OTHER THAN THE RAW SHALE DISPOSAL

      (1) TIMING
      (2) TECHNIQUES AND MATERIALS

   C. REVEGETATION OF RAW SHALE DISPOSAL PILE

      (1) REVEGETATION TIMETABLE
      (2) METHODOLOGY
      (3) ALTERNATIVES

4. SUMMARY — GOALS

RMP

FISH AND WILDLIFE PLAN - OUTLINE

1. INTRODUCTION
2. DESCRIPTION OF LEASE TRACT
3. PROPOSED ACTION
4. ESTIMATED EFFECTS OF ACTION
5. MITIGATION MEASURES
6. SUMMARY

RMP

1. INTRODUCTION (AND HISTORY)

2. DESCRIPTION OF LEASE TRACT

A. TOPOGRAPHY

B. VEGETATION

(1) PINYON JUNIPER
(2) CHAIN PINYON JUNIPER
(3) VALLEY SAGEBRUSH
(4) UPLAND SAGEBRUSH

C. FISH AND WILDLIFE (FAUNA)

(1) LARGE MAMMALS
(2) MEDIUM MAMMALS
(3) SMALL MAMMALS
(4) REPTILES AND AMPHIBIANS
(5) AVIFAUNA (BIRDS)
(6) FISH
(7) ARTHROPODS (INSECTS)
(8) ENDANGERED OR THREATENED SPECIES

RMP

3. PROPOSED ACTION

- DESCRIPTION OF PROPOSED ACTIVITIES WITH ESTIMATES OF ACREAGES

4. ESTIMATED EFFECTS OF ACTION

5. MITIGATION MEASURES

A. HABITAT CONVERSION

- COOPERATIVE EFFORT WITH D.O.W. AND B.L.M.

B. HABITAT RESTORATION

6. SUMMARY

- WITH STATEMENT OF PUBLIC ACCESS

RMP

The Ralph M. Parsons Company
Parsons-Jurden Division

Form 1279–3
(June 1984)

BORROWE

DATE LOANED	BORROWER

USDI – BLM